Sādhanā Vol. 31, Part 3, June 2006, pp. 235–244. © Printed in India

Detection of bearing defects in three-phase induction motors using Park's transform and radial basis function neural networks

IZZET Y ÖNEL, K BURAK DALCI and İBRAHIM SENOL

Yildiz Technical University, Electrical-Electronics Faculty, Electrical Engineering Department, 34349 Besiktas, Istanbul, Turkey
e-mail: {ionel,dalci,senol}@yildiz.edu.tr

MS received 15 March 2005

Abstract. This paper investigates the application of induction motor stator current signature analysis (MCSA) using Park's transform for the detection of rolling element bearing damages in three-phase induction motor. The paper first discusses bearing faults and Park's transform, and then gives a brief overview of the radial basis function (RBF) neural networks algorithm. Finally, system information and the experimental results are presented. Data acquisition and Park's transform algorithm are achieved by using LabVIEW and the neural network algorithm is achieved by using MATLAB programming language. Experimental results show that it is possible to detect bearing damage in induction motors using an ANN algorithm.

Keywords. Induction motor; stator current; bearing damage; Park's transform; RBF neural network.

1. Introduction

Induction motors are frequently used in industrial applications in a wide range of operating areas, due to their simple and robust structure, and low production costs. The reliability of an induction motor is of paramount importance in industrial, commercial, aerospace and military applications. Bearings play an important role in the reliability and performance of all motor systems. Due to the close relationship between motor system development and bearing assembly performance, it's difficult to imagine the progress of modern rotating machinery without consideration of the wide application of bearings. In addition, faults arising in motors are often linked to bearing faults. The results of various studies show that bearing problems account for over 40% of all machine failures (Schoen 1995).

In many situations, vibration monitoring methods are utilized to detect the presence of an incipient bearing failure. Vibration monitoring is a reliable tool for bearing failures. The vibration data typically contain fault signatures and salient fault features because of the direct measurement of the critical signal and placement of the vibration sensor. However, placing a sensing device on the motor might not be possible or practical in many applications,